

Exposure of persons during gamma radiography of a barge

Description of the incident

Parties involved:

- Company A: Shipyard and site owner, manufactures two barges for a client.
- Company B: Sub-contractor for A, hydraulic equipment supply and maintenance
- Company C: Sub-contractor for B, industrial automation and electrical
- Company D: Sub-contractor for A, NDT company

The sequence of events was as follows:

- Company A manufactures a barge (6 m x 20 m) in its workshops, and subcontracts the supply and the implementation of hydraulic equipment to B. No safety agreements are established between the two parties, although the duration of on-site work exceeds 400 hours.
- Company B sub-contracts electrical wiring of a control cabinet to company C (no safety agreements in place).
- Company A assigns Company D to carry out the verification of the welds on the barge by gamma radiography. A safety plan is formalized and signed between the two parties before the beginning of the work.

On the day of the incident:

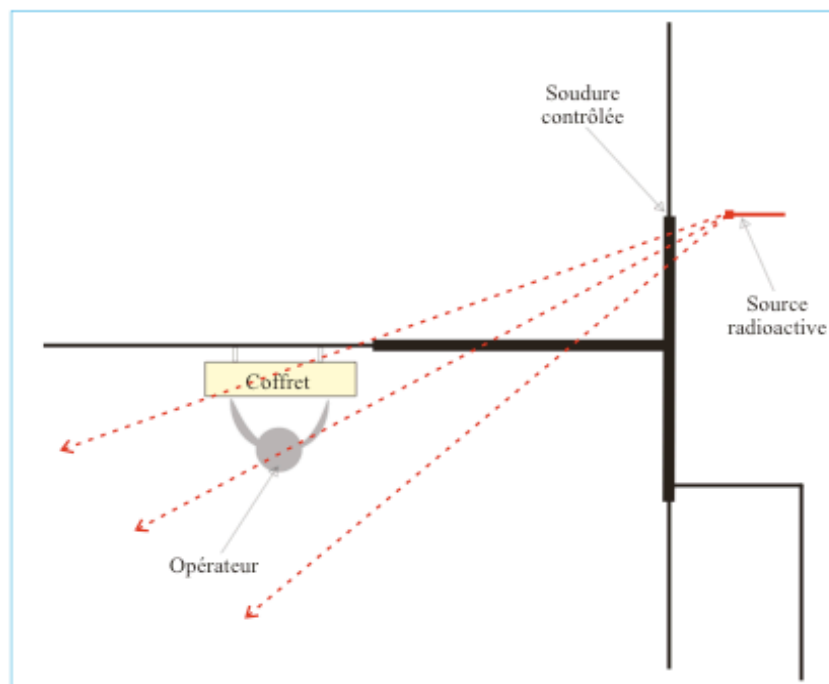
- Two Company C electricians (a team leader and an apprentice) are working in the barge, as well as 15 employees of Company A. There is a lot of noise on site and the electricians are wearing ear defenders.
- At approximately 2:00 p.m., the electrician team leader (Company C) is called to another site for the same client. The apprentice works alone in the barge for the rest of the afternoon, still surrounded by employees of Company A.
- At approximately 4:30 p.m., two people from Company D arrive in the workshop to perform radiography on the welds; planned for 5:00 p.m. (Company A was advised of this several days before). They demarcate the workshop and have the personnel evacuated by a person from Company A. No one thinks to warn the apprentice from company C.
- A Company D employee goes down into the barge to set up the film and does not notice the presence of the electrician (the barge is partitioned into several compartments).
- Before proceeding with the exposure, one of the radiographers calls out to ensure that nobody is located in the exclusion zone. The apprentice electrician, who has not been informed of the radiography, does not hear this since he is wearing hearing protection. Therefore, he continued his work waiting for the return of his team leader.
- The area, including the apprentice, is then irradiated for 7 minutes and 30 seconds.

At the end of the check, the film is recovered and the warning signs and barriers removed from the workshop. The operators of company D inform Company A that the work is complete and leave the premises without considering the incident that just occurred.

On a tour of the workshop, Company A's workshop leader notes the movement of a portable electric cable on the pontoon. He then becomes aware that a person was present in the barge during the radiography.

The following diagram indicates the position of the apprentice electrician during the radiography.

Soudure contrôlée = Checked weld
 Source radioactive = Radioactive source
 Coffret = Electrical cabinet
 Opérateur = Apprentice electrician



Radiological consequences

The apprentice, who was not directly involved with the radiography, wore no dosimeter and knew nothing about the risks associated with gamma radiography. It was estimated that the apprentice received a dose of 0.38 mSv.

Lessons to be learned

The development of safety plans between a client and contractors is mandatory for potentially risky operations. These plans must define the safety measures and precautions which are to be taken by each party involved. In this incident, in addition to the lack of safety plans between companies A and B, and companies B and C, it appears that the various parties were not familiar with the planning of the various work activities being undertaken. This case illustrates an obvious lack of communication between the client and the various sub-contractors.

The existence of a safety plan does not remove the requirement for the radiographer to verify that nobody is located in the exclusion zone. This task may prove difficult, particularly if the exclusion area is of significant size or whether other parties are involved. However, a search must be made of the entire premises affected by the radiography area.

In this example, the construction was behind schedule, which may explain why a thorough search of all compartments of the barge had not been carried out. The radiography company was content to rely on the evacuation report prepared by Company A, who were not informed that the employees of company C were on site.

The agents of the intervening and user companies must be informed of the potential risks and consequences of an exposure during radiographic firings. The objective is that every person expected to have anything to do with radiography is fully aware of the risks incurred. Here, the apprentice of company C had never been made aware to this problematic.